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Springer
2018

Paavola , S & Hakkarainen , K 2018 , Community of inquiry and inquiry-based learning . in M A Peters (ed.) , Encyclopedia of Educational Philosophy and Theory . Springer , Singapore . https://doi.org/10.1007/9

http://hdl.handle.net/10138/298828
https://doi.org/10.1007/978-981-287-532-7_572-1

acceptedVersion

Community of Inquiry and Inquiry-based learning

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A draft of an article: Paavola, S. & Hakkarainen, K (in press) Community of inquiry and inquiry-based learning. In T. Strand & C. W. Legg (Section Editors) *Peirce and Education*. Encyclopedia of Educational Philosophy and Theory (edited by Michael A. Peters). Springer.

Introduction

Charles S. Peirce's conception of inquiry is both a challenging and an easy topic to analyze from an educational perspective. During his long life Peirce developed various conceptions concerning signs, reasoning, logic, and inquiry. Peirce's philosophy and semiotic system provide a multitude of overlapping illustrations for processes of inquiry. He wrote surprisingly little explicitly on education. He had, however, famous dictums on learning and inquiry, emphasizing their importance for the epistemology. According to his "first rule of reason":

> Upon this first, and in one sense this sole, rule of reason, that in order to learn you must desire to learn and in so desiring not be satisfied with what you already incline to think, there follows one corollary which itself deserves to be inscribed upon every wall of the city of philosophy, *Do not block the way of inquiry*. (EP 2:48, 1898)

For a long time after Peirce's death, his philosophy and semiotic system was mostly marginalized. The same was true of his formulations of inquiry with notable exceptions like N. R. Hanson. In the 1990s Peirce's notion of inquiry started to attract more attention. Hintikka (2014, 103) has stated bluntly that Peirce was not just a predecessor of later "discoveries" but his ideas are still ahead of many contemporary formulations. Peirce's ideas transcend the borders of standard formulations of analytic philosophy, pragmatism, critical theory, phenomenology, and hermeneutics, having elements from and giving elements to different approaches.

Synonyms

- Stages of inquiry; Models of inquiry; Methods of inquiry

Peircean formulations of inquiry

Inquiry as the settlement of opinion

Peirce formulated a conception of inquiry and scientific method in his classic papers "The Fixation of Belief" and "How to Make Our Ideas Clear." These articles were meant for a wider audience and have left room for different interpretations and tensions. The tensions concern the nature of Peirce's pragmatism (to what extent it is practically oriented), and the nature of realism (to what extent "real" is defined as independent or dependent on human practices).

Peirce presents inquiry which is in between the dynamics provided by "doubt" and "belief."

> The irritation of doubt causes a struggle to attain a state of belief. I shall term this struggle *inquiry*, though it must be admitted that this is sometimes not a very apt designation … With the doubt … the struggle begins, and with the cessation of doubt it ends. Hence, the sole object of inquiry is the settlement of opinion. (EP 1:114-5, 1877)

Peirce interprets beliefs as closely related to habitual actions, and some kind of dispositions to act. Beliefs show in, and shape, our actions. Doubt is "an uneasy and dissatisfied state from which we struggle to free ourselves" (ibid. 114). For inquiry, both doubt and belief are needed. The aim is the settlement of beliefs but doubts are the stimulus for the inquiry.

In "The Fixation of Belief" Peirce complements his model of inquiry with four methods of fixing beliefs, namely 1) "the method of tenacity," 2) "the method of authority," 3) "the a priori method," and 4) "the scientific method." Peirce asks that if the aim of inquiry is the settlement of opinion, why should one not just stick to some opinion? In fact, this is precisely what many people do. People often dislike an undecided state of mind, and hence they cling to certain views, and avoid different kinds of opinion. This "method of tenacity" works as such but the "social impulse" is against it. People notice that others think differently. "The method of authority" can, to a certain extent, solve this problem. It is based on the power of institutions. People are kept in ignorance and/or they are forced to follow certain doctrines. This method has been used

throughout history, especially by theological and political organizations. It is found "[w]herever there is an aristocracy, or a guild, or any association of a class of men whose interests depend or are supposed to depend on certain propositions" (ibid., 117). This is not a lasting solution to the settlement of opinions either. Some individuals "see that men in other countries and in other ages have held to very different doctrines" (ibid., 118). The "a priori method" is based on people regarding things from different angles, and then formulating beliefs agreeable to reason. An example is the history of metaphysical philosophy which has "not usually rested upon any observed facts, at least not in any great degree" (ibid., 118-9). It makes beliefs more or less a matter of taste or fashion. Peirce's example is the doctrine that human beings only act selfishly. "This rests on no fact in the world, but it has had a wide acceptance as being the only reasonable theory" (ibid., 119). What Peirce calls the "scientific method" aims at improving on this. Peirce does not argue for some specific scientific method (like inductivism or deductivism), or say that science always follows it. Instead, he explicates the general characteristics of fixing beliefs caused "by nothing human, but by some external permanency" (ibid., 120). This must be something that affects everyone, not just some individuals (otherwise a social impulse is again against it). Peirce ends up having a conception of truth and reality sound like a strong version of realism: "The opinion which is fated to be ultimately agreed to by all who investigate, is what we mean by the truth, and the object represented in this opinion is the real" (EP 1:139; 1878). Peirce's conception of the scientific method is not, however, based just on external permanency (or on permanent "facts" like in the traditional conception of school learning) but on the strong "social impulse" to doubt existing beliefs if there are good reasons for doing so. In his later life Peirce emphasized a version of scholastic realism, maintaining that besides real generalities, there are also real "vagues" and real possibilities (EP 2:354, 1905). It is the purpose of inquiry to show what *would* be a conclusion on a certain issue if the investigation is carried sufficiently far.

In these papers Peirce presented his famous maxim of pragmatism, which was originally a method for the analysis of concepts and their meanings:

> Consider what effects, that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object. (EP 1:132, 1878)

A 1903 formulation is more illustrative and metaphorical:

> The elements of every concept enter into logical thought at the gate of perception and make their exit at the gate of purposive action; and whatever cannot show its passports at both those two gates is to be arrested as unauthorized by reason. (EP 2:241, 1903)

The maxim has had a significant influence on the establishment of pragmatism (EP 2:334, 1905), emphasizing the close connection and interaction of conceptions with practical effects and purposive action. Inquiry is carried out in a practical human context.

Three stages of inquiry

Peirce's conception of inquiry can also be described by using his distinction between three main forms of inference, that is, abduction, induction, and deduction. In his earlier works they were treated as separate forms of reasoning. Later, he emphasized them methodologically as three stages of inquiry (EP 2:75-114, 1901; EP 2:440-442, 1908): "Every inquiry whatsoever takes its rise in the observation, … of some surprising phenomenon, some experience which either disappoints an expectation, or breaks in upon some habit of expectation …" (EP 2:440-1). This instigates a search for a conjecture, or a possible explanation which would resolve the anomaly. The search and preliminary adoption of a hypothesis is *abductive*. If the hypothesis fits well with the facts and resolves surprises the inquirer is inclined to believe it. But there are always (at least in principle) a multitude of hypotheses that could explain the facts. It is important to test the suggested solution and see if it works in addition to the experience that started the inquiry. At the second stage, experiential consequences are drawn from the hypothesis *deductively*, that is, what would follow if the hypothesis were true. In the third stage, characteristically *inductive*, it is ascertained by using actual tests that "the hypothesis is sensibly correct, or requires some inessential modification, or must be entirely rejected" (ibid., 442).

Logic as semiotics

Peirce's notion of inquiry can also be seen as part of his broad notion of logic. Peirce developed logic as a formal and mathematical research field. But in its broadest sense, logic was for him a

synonym for a theory of signs in general (CP 2.227, c. 1897; see 'Logic' in Bergman and Paavola, 2017).

Peirce's famous theory of signs was triadic, that is, it had three main elements: a *sign* itself, an *object* for which it stands for, and an *interpretant* which is another representation determined by the sign. Besides critic (emphasizing the validity of arguments), logic covers grammar (general theory of signs), and methodeutic, or rhetoric (on conducting inquiry or on transmission of meanings). It covers "logica docens", that is, scientific studies of arguments, and "logica utens" meaning a practical art of using arguments. According to Peirce's system, logic is based on other normative sciences, namely on ethics and esthetics. Besides symbols, logic also covers indices and icons. Indices bring forth physical connections between signs and objects. Icons highlight visual and perceptual elements in human thought and reasoning. Imagination and "musement" are a basis for human creativity. Besides abductive reasoning, Peirce defined analogies and metaphors as central elements of human thought. He emphasized the dialogic nature of sign processes; moreover, our own thinking is a dialogue within ourselves (EP 2:402, 1907). He had modern conceptions like "common ground," pointing out that two speakers must have some kind of common experience or mutual knowledge in order to start understanding each other at all. Peirce also formulated a semiotic theory of mind which was similar to modern ideas of distributed cognition. Mind operates not just with signs in "our heads" but uses all kinds of "external signs": "In my opinion it is much more true that the thoughts of a living writer are in any printed copy of his book than that they are in his brain" (CP 7.364, c. 1902).

Broader notions of a Peircean model of inquiry

Peirce's conception can also be seen in relation to his broader doctrine of research and inquiry besides pragmatism and (scholastic) realism.

Fallibilism

Fallibilism is "the doctrine that our knowledge is never absolute but always swims, as it were, in a continuum of uncertainty and of indeterminacy" (CP 1.171, c. 1897). This doctrine is based on Peirce's metaphysics of growth and development, and also on human experience of the history of

sciences. Many things which have been treated as infallible have turned out not to be certain or as exact as previously thought: “Absolute infallibility may belong to the pope and the ecumenical councils” (CP 2.75, 1902) but it is not applicable in scientific research. Peirce was, however, also against skepticism, opposing “paper doubt.” Just putting a proposition into the interrogative form does not stimulate inquiry (EP 1:115, 1877). Inquiry requires “a real and living doubt” (ibid.).

Critical common-sensism

In his later life Peirce formulated a doctrine of “critical common-sensism” (see EP 2: 346-353, 1905; ‘Critical Common-Sensism’ in Bergman and Paavola, 2017). It is a variety of the philosophy of common sense according to which there are some indubitable propositions and inferences. It highlights, however, that indubitable beliefs are vague and apply mostly to quite primitive things (one example is that no sane human being doubts that fire would burn one’s fingers – EP 2:433, 1907). *Critical* common-sensism has a high esteem for living doubt, especially on matters which are beyond instinctual experience. Things which are treated as indubitable can change. Peirce’s ideas of inquiry and philosophy provide a continuum starting with common sense beliefs, which might be practically indubitable but historically changing, and might move towards more consciously and scientifically formulated propositions.

Theories of growth and evolution

Peirce formulated conceptions of evolution and growth in a series of *Monist* articles in the early 1890s (EP 2:285-371, 1891-3). Peirce called the conception according to which development happens by mechanical necessity, *anancastic* evolution. *Tychastic* evolution or tychism is the doctrine that absolute chance guides evolution and growth. Peirce himself favored *agapastic* evolution or agapasm, where some kind of purpose for or attraction to an idea leads evolution. Peirce’s formulations have been criticized as wild metaphysical speculations. They, however, describe processes of development where chance and purpose, or necessity and freedom, are combined, providing classic puzzles for education and learning.

Epistemologies of mediation

Peirce did not name his epistemology explicitly. He depicts a dynamic approach to a theory of knowledge where empiricism and rationalism are merged together. It has elements from his anti-Cartesianism, realism, pragmaticism, and a broad conception of theory of signs. He criticized Cartesianism and a rationalistic a priori method for not taking empirical observations and multiplicity of conceptions into account. But his epistemology is not traditional empiricism either. Observations are a starting point for inquiry but are abductively rather than inductively based on an interaction between observations and conceptions from the start. He criticized nominalism as a doctrine according to which general elements are produced by human cognition merely as a convenience for understanding (see CP 4.1, 1898; 'Nominalism' in Bergman & Paavola 2017). He supported scholastic realism as an alternative. In his semiotic theory, signs do not just refer to other signs but to objects and realities. His epistemology builds on the dynamic idea of mediation with elements from different categories, that is, Firstnesses (qualities, spontaneity, feeling, possibilities), Secondnesses (actualities, brute reaction, indices), and Thirdnesses (sign processes, representation, mediation). Peirce depicts an epistemology which is a future-oriented, historically developing, social process starting with living doubt, and grounded on emerging interpretations of reality with practical effects (a concise description of Peirce's method of inquiry is provided in Strand, 2005).

Peircean inquiry and educational philosophy

Three special issues are dedicated to Peirce from the point of view of educational philosophy (see Semetsky, 2005; Colapietro et al., 2005; Strand, 2013). Peirce "posited logic as a theory of dynamic inquiry irreducible to some indubitable and certain knowledge" (Semetsky, 2005, 153). It is also stated that Peirce's views come close to the Herbartian conception of Bildung aiming at nurturing critical thinkers. Peirce promotes active learning in line with Dewey's experiential learning. Even if Peirce neglects the topic of gender, his fallibilism is a promising ally for feminism when it removes the assumptions of absolutism, universality, and neutrality. Peirce's semiotic theory of learning has been analyzed, as well as the dialogic conception of sign processes, and Peirce's rhetorics provide dynamic means of understanding the meaning of communication. Imagination, observation, reasoning skills, and esthetic outlook are in fact important themes in Peircean inquiry

and learning. The Peircean theory of knowledge also provides a means for analyzing old paradoxes about learning and inquiry, like the classic Meno paradox. The themes of growth and self can also be analyzed using Peirce's conceptions, and another interesting theme is Peirce's realism and critical common-sensism.

Peirce's models of inquiry have been used surprisingly rarely in *empirical* educational research. Neither have they provided clear-cut pedagogical models for inquiry learning. Peirce's philosophy has directly or indirectly influenced, however, concurrent inquiry learning models, such as 1) Bereiter's (2002) knowledge building approach guiding learning communities to assume collective responsibility in the advancement of knowledge, 2) Hakkarainen and colleagues' (2004) progressive inquiry model emphasizing cyclic collaborative inquiry processes guided by learners questions and working theories, and 3) the trialogical learning model addressing object-oriented inquiry processes in interaction between educational and other communities (Paavola and Hakkarainen, 2005).

These inquiry models share characteristics with Peirce's pragmatist theory of inquiry even when their interlinkages often remain implicit. Firstly, engaging learners in posing their own explanation-seeking questions and working theories through iterative cycles of inquiry is highlighted. In accordance with abduction, inquiry is guided by conjectures based on conceptual and practical background knowledge. Secondly, emphasis is placed on dynamic processes of developing knowledge objects that are materially embodied. Thirdly, rather than taking place merely within the mind, inquiry involves the use of external tools, including signs and conceptual artifacts. Fourthly, interrelations between thinking and acting are highlighted as well as integration between levels of knowing in contrast to the traditional science education, which overemphasizes conceptual and rational aspects of inquiry. Inquiry-based practices engage learners not only with symbolic generalizations (Thirdnesses) but with qualities of feeling (Firstnesses) to be explored through practical experimentation (Secondnesses). Transformations between these levels facilitate learning and development. Fifthly, inquiry-based practices examine the meaning of concepts in relation to practical consequences. Learners are guided to function as a community, and this entails self-organizing processes that gradually raise epistemic standards of interpretation within learners. Peirce's philosophy provides several means for highlighting the community of inquiry foregrounded through the emergence of modern collaborative technologies.

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